Historical Notes on The Relation of Fires to Forests

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IN EUROPE, where some of our earlier American foresters were born or trained, forest fires are rare and usually pretty destructive. That tradition was brought to this country long ago, and was found to apply rather well to the northern United States, and was so incorporated into the teachings of our foresters.

In the spruce-fir forests of the North fire can be a terrible thing, and some great fires have gone down in history. With wind pushing them, they used to sweep through the trees and kill them, and destroy all other living things in their path, even fish in the streams, and towns and villages. Such fires in New Brunswick in 1825, Wisconsin in 1871, Michigan in 1881, and Minnesota in 1894, swept over hundreds of square miles and killed thousands of people.

In Illinois and farther west, when the country was sparsely settled, prairie fires were terrifying, and sometimes destructive of life. Even canebrake fires have been known to occur long ago in Alabama (*American Journal of Science*, March, 1851). So it is no wonder that people who knew about these things should regard fire as an enemy, to be fought by all possible means. Even yet, ecological textbooks and articles commonly treat fire as an accident or ignore it.

One can find in the narratives of some early travelers,

such as Bartram, evidence of the frequent or occasional occurrence of fire in southern forests, but the earliest observer that I know of who seemed to realize that it had some significance was Charles Lyell, an eminent English geologist, who was a keen observer of all sorts of natural and human phenomena. He visited the United States twice in the 1840's and published a book (in two small volumes) about each trip. Early in 1846 he visited Tuscaloosa, Alabama, and was taken by one of the university professors to some coal fields a few miles east, passing through some open forests of Longleaf Pine on the way. He was told that the openness of the forests was due to frequent fires, which did not hurt the pines, but kept down the more sensitive hardwoods, which might otherwise have sprung up and choked them out.

About thirty years ago this forest area was cut over pretty clean, and then protected from fire afterward, and there has been very little reproduction of Longleaf Pine there since.

Up to that time trees were so abundant in the eastern half of the United States that they were in the way of farmers who wanted to use the land for crops, and hardly anybody cared if fire was used to help get rid of them. Indeed, with the building of railroads, giving outlets to the more fertile lands west of the Alleghenies, many farmers were leaving New England and letting their land grow up in trees, and they were clearing and burning the forest of the Mississippi Valley to plant crops there.

But interest in forestry in the United States may be said to have begun in the '70's, when it was realized that our forests were not inexhaustible. The U. S. census of 1880 devoted a quarto volume to trees and forests, under the direction of Professor C. S. Sargent, describing their present condition in every state, with the chapters written by competent men familiar with local conditions. But Professor Sargent, like other New Englanders, was a "fire fundamentalist," and notes on the destructiveness of fire are scattered through the volume.

In the chapter on South Carolina there is a paragraph on "Burning off dead herbage" (in the Longleaf Pine forests), a

practice viewed with alarm. In the one on Alabama, by Charles Mohr, of Mobile, it is stated that during the census year 569,160 acres of woodland were reported "destroyed" (*sic*) by fire, with an estimated loss of $221,125. (Similar estimates were given for most other states.) Farther along in the same chapter, under the head of Pike County, there is a short section that is prophetic, though the author did not realize it at the time, or during his lifetime. It refers to the "pogosines" (pocosin), a peculiar type of vegetation, with no suspicion that fire may have had anything to do with it. (More about this farther on.)

In 1889 Mrs. Ellen Call Long, of Tallahassee, who must have been a very brilliant woman, sounded one of the first discordant notes in the chorus of denunciation of fire. At a meeting of the American Forestry Congress she suggested that the hammocks of Florida, which are areas of dense shady forests bordered by open pine woods, owe their existence to being in places pretty well protected from fire by adjacent bodies of water, or otherwise. That was carrying Lyell's reasoning a little further, but it was so heretical that little attention seems to have been paid to it at the time.

At that time Professor Sargent was conducting a weekly magazine, *Garden and Forest*, devoted to botany, forestry, horticulture, and related subjects. In the issue for February 17, 1892, he wrote on Florida pines, and expressed the opinion that the Longleaf Pine in Florida would soon be exterminated by lumbering, turpentining, and especially fire, and that the territory occupied by it would ultimately turn into a desert of shifting sand.

George V. Nash, of the New York Botanical Garden, spent several months in Florida in 1894 and 1895, when the peninsula was just being opened up by new railroads, and he published some interesting observations in the *Bulletin of the Torrey Botanical Club* for April, 1895. He noted that the high pine land of the lake region was swept by fire every year or so, but most if not all the herbs in it were perennials, with thick roots well below the surface, which enabled them to sprout up again after a short time.

In 1895 W. W. Ashe, a prominent botanist and prolific writer of North Carolina, authored a state Geological Survey bulletin on forest fires, in which he expressed the (quite erroneous) opinion that fire had been very detrimental to Longleaf Pine in eastern North Carolina, and had favored the growth of some other trees. (On a visit to Tallahassee a few decades later he told me that he was a fundamentalist, as far as the evolution of species was concerned; and he was evidently a fire fundamentalist too.)

In 1896 (with a revised edition in 1897) Dr. Charles Mohr, a German-born, highly respected botanist of Mobile who had collaborated with Professor Sargent in 1880 (as previously mentioned), authored a quarto government bulletin on the timber pines of the South, in which he regarded fire as an unmitigated evil.

About the same time Professor Sargent began the publication of a ponderous "Silva of North America," which ultimately comprised fourteen volumes. In the second volume, published in 1897, he discussed the supposed harmful effects of fire and grazing on Longleaf Pine.

In 1899 Gifford Pinchot, then chief of what later became the U. S. Forest Service, published a little "Primer of Forestry" bulletin, in two volumes. In that he had much to say about fire (from which I have taken the notes on destructive fires of early years, a little farther back), but very little about its possible beneficial effects. However, in an article on the relation of forests and forest fires, in the *National Geographic Magazine* for October, 1899, he recognized the fact that Longleaf Pine resists fire better than most other trees.

In 1900 the state geologist of New Jersey published as a supplement to his annual report for 1899 a 327-page volume on forests, by several different men, including foresters, an engineer, a botanist, and an entomologist. Mr. Pinchot contributed about 60 pages, with special reference to fire on the pine barrens, which cover much of the southern half of the state.

The commonest pine in New Jersey is the Pitch Pine (*Pinus rigida*), which grows in large pure stands, frequently

burned, but it survives rather well by sprouting out again after a fire. (Some of the illustrations showed this.) Mr. Pinchot observed that many owners of forest property were accustomed to burning off the leaf litter (which we would call pine straw) in early spring, before it got thick enough to make a destructive fire—somewhat as is done in the Longleaf Pine forests of the South. But, like other foresters, he was opposed to fire on general principles.

A little farther along in the New Jersey forest volume Mr. Pinchot repeated from the state geologist's report of the previous year a description of the "Plains," an area of about twenty-five square miles in the middle of the pine barrens region, where most of the trees are not as tall as a man. This had existed from the time of the first white settlement, and its boundaries had remained pretty constant all that time. (I crossed it once, about forty years ago.) Just what caused the pines to be so stunted there is still conjectural, but one theory is frequent fire. But it is not obvious why fire should be more frequent there than elsewhere, when the area is practically uninhabited, and why the boundaries of the area are so constant.

In 1902 the U. S. Department of Agriculture, under the sponsorship of President Theodore Roosevelt, a prominent conservationist, published a profusely illustrated large octavo volume on the forests of the southern Appalachian region, as part of a campaign for establishing a national forest there (which ultimately succeeded). One of the illustrations is a full-page picture of Stone Mountain, Georgia, with the statement under it: "The ax and fire have removed the forest; and heavy rains have removed the soil which once covered the larger part of this rocky knob." This of course was a gross exaggeration and conveniently ignored the fact that Stone Mountain must have been about as bare as it is now ages before there were any human beings to set fire to the forests (of which there are still some patches on the mountain).

From 1900 to 1904 I botanized extensively in South Georgia, and could not fail to notice that fire was frequent in Longleaf Pine forests, but I did not give it much thought. In the

spring of 1904 I even took a picture of fire burning in some pine tops lying on the ground after logging in Emanuel County, and I published it in 1906 in my study of the Altamaha Grit region. In that I discussed fire a little, and treated it as one of the effects of civilization, but did not realize its significance, as I would have if I had been aware of the work of Mr. Lyell and Mrs. Long.

In the fall of 1905 I went to Alabama, to continue Dr. Mohr's work on trees and other useful plants, and the following spring, when I was exploring some of the lower mountains of Blount County, where there was considerable Longleaf Pine, well away from its main areas in the coastal plain, I noticed that all the pines there bore marks of fire, as in the coastal plain. And I began to wonder if that was universal for that species.

In the fall of 1908 I went to Florida to study the peat deposits for the State Geological Survey, and that involved traveling widely over the state. Further, it gave me an opportunity to study all sorts of vegetation, which was in more nearly natural condition than that of any other eastern state, only about ten per cent of the area being under cultivation. (The population is about five times as dense now, and the vegetation has suffered correspondingly.)

January 21, 1909, found me in the vicinity of Lake Tsala Apopka, in the eastern part of Citrus County. That is a large shallow lake with very irregular outlines and several large islands in it, so that only a small part of it can be seen from any one point on its shores. The water was rather low at that time (that being the dry season), so that I could make some short-cuts from one peninsula to another instead of going around the intervening embayments. I walked across a few of the peninsulas, which were then relatively undisturbed, and found that they, as well as the islands, were covered with hammock vegetation, with fairly sharp transitions to the adjacent Longleaf Pine forests.

There was no difference in soil to account for the abrupt transition, except that the hammocks had more humus, which was a natural consequence of the denser vegetation. I soon concluded that the cause of the difference in vegetation was

that the water in the lake formed a barrier to the fires which must have periodically swept the pine woods. The islands had complete protection, and even if a peninsula had been originally covered with pine forest, any fire starting down it would have a good chance of stopping before it reached the end. Thus the hammock vegetation might start at the tip of a peninsula and gradually spread to its neck, beyond which fire sweeping through the unprotected pine woods would stop it.

I soon found many other similar conditions in Florida and recalled some that I had seen in other states, particularly in the Altamaha Grit region of Georgia, another sandy region, covered mostly with Longleaf Pine forests, where most creeks are bordered on one side by hammock vegetation, protected from fire on one side by the creek or its swamp, and on the other by sand-hill vegetation, with not enough grass to carry fire. I published a note on this in the *Bulletin of the Torrey Botanical Club* for November 1911, and some of my "fire fundamentalist" friends were pretty skeptical, but they could suggest no better explanation for the hammock vegetation.

A few years before that, the last day of my first engagement in Alabama, in July, 1906, I stopped overnight in Brundidge, and there heard about a peculiar patch of forest a few miles away, known as the "pocosin." I was not then aware that it had been described briefly in an Alabama geological report in 1858 and that Dr. Mohr had visited it in 1880. I knew hammocks in Georgia and guessed that the pocosin might be something like them.

I had no chance to visit it until the fall of 1912, after the completion of my second engagement in Florida. Meanwhile it had been mapped, but not described, in a government soil survey in Pike County, made in 1910 and published in December, 1911. The map shows it as a roughly circular area about half a mile in diameter, about half way between Troy and Brundidge, but not distinguished as to soil from the surrounding "Norfolk coarse sand." This helped me find it on November 6, 1912, and March 27, 1913.

As I expected, it was a typical sandy hammock, some-

thing rare in Alabama, but fairly common in south Georgia and Florida. It is protected from fire by a creek and tributary ravines on one side, and sand-hill vegetation on the other. It happens to be in a belt a few miles wide where I have seen no Longleaf Pine, and the sand-hill vegetation consists mostly of Shortleaf Pine (*Pinus echinata*) and small oaks, with plenty of bare sand, and very little grass to carry fire. The pocosin, like most hammocks, is pretty dense and shady, and the commonest tree in it is *Quercus laurifolia* (Evergreen Willow Oak), which is quite characteristic of such places (and many other places protected from fire). I published a note on it, with one illustration, in my first report on Alabama forests, 1913, and a more detailed account in the *Bulletin of the Torrey Botanical Club* for May, 1914.

I went by there with a fire fundamentalist (then unknown to me as such) one day in the spring of 1931, and he was sufficiently impressed by it to mention it in a narrative of his trip, published a few months later, but in that he stated that its cause was unknown. My account of it, published seventeen years before, was accessible to him, and if he disagreed with that he should have said so, and explained why, instead of trying to nullify it by ignoring it.

Going back a little, in the summer of 1912 I spent two months in northern lower Michigan, where I made my first acquaintance with the northern spruce and fir (or Christmas tree) forests, there chiefly confined to bogs, but more widespread farther north; the Jack Pine, with very short leaves, and presumably pretty sensitive to fire; and the Red or Norway Pine, whose relations to fire are probably not very different from those of some of the southern short-needled pines.

Nearly five years elapsed before I made a report on that summer's work, but meanwhile I utilized some of my experience there in an article on the coniferous forests of eastern North America, in the *Popular Science Monthly* for October, 1914. In that I pointed out the relations of each species to fire. Although I did not stress that point there, it seems that as a

rule the pines with shortest leaves have the thinnest bark and are most sensitive to fire, and vice versa.

Most of our conifers commonly occur in pure stands, and each type of forest seems to have a normal frequency of fire, ranging from never in the case of thin-barked trees like the Red Cedar (*Juniperus virginiana*) and River Cypress (*Taxodium distichum*), to once in a lifetime of a tree in the northern Christmas tree forests (spruce and fir) and Sand Pine (*Pinus clausa*), with very short leaves, to about once in ten years in the Norway and southern shortleaf pines, with leaves of medium length, and about five years out of ten in Longleaf Pine. (There is a thick-barked juniper, *Juniperus pachyphloea*, in the Southwest, and I would guess that it has considerable resistance to fire, but I know of no investigation that has been made of that.)

In my first report on the forests of Alabama, published in 1913, I discussed the relation of Longleaf Pine to fire, pointing out among other things that if the pine woods were never burned most of the pine seeds (misprinted "seedlings") would lodge in the grass and pine straw that cover the ground most of the time, and would never germinate, for they germinate best on bare sand.

I had an opportunity to get more light on that in Citrus County, Florida, in March, 1914. Then I walked over large areas of Longleaf Pine forest that had been burned over quite recently, leaving the ground pretty bare. Pine seedlings, a few inches high, were scattered over the area at a rate of three or four to the square foot, or about 100,000,000 per square mile. (If all had survived, they would have made such a dense growth of trees in a few years that it would have been impossible for anything much larger than an ant to get through.) Evidently the previous season had been a good seed year, which is said to come only about once in five years in Longleaf Pine.

That same month I spent more time around Lake Tsala Apopka, in the same county, than I had in 1909, and I found the vegetation of its peninsulas more diversified than I had previously realized. Some of it, instead of hammock, was a

dense stand of Sand Pine, one of the most sensitive to fire of all our pines, heavily draped with Spanish moss. In most places where it grows (nearly all in Florida), the so-called scrub, as trees with bare areas of white sand between them, and many shrubs, but no grass to carry fire. But presumably fire does occasionally get into the scrub and sweeps through the tops of the trees and kills them, as in the spruce and fir forests of the North. At such times the Sand Pine cones, which have been closed tightly for many years (whence the name *clausa*) open soon afterward, and scatter seeds for a new crop. (The Lodgepole Pine of the Rocky Mountains, another species with very short leaves, is said to behave similarly.)

At this time I climbed a pine tree about twenty feet, to take pictures of the forest, and noticed that the bark high up on the trunk was very thin, and readily peeled off in approximately circular scales, exposing the cambium beneath.

My Alabama forest report of 1913 was reviewed in the *Journal of Forestry* for December of that year by Dr. C. D. Howe, its editor, a typical New Englander, and a fire fundamentalist. He pounced on my statements about fire, and thought it was a curious psychological phenomenon that my views should be so similar to those expressed by Mrs. Long in 1889 (which I did not know about at the time I wrote).

The editor of *American Forestry* (Washington) was more favorably impressed, and he asked me to prepare an abstract of my Alabama report for him and to elaborate somewhat my views on fire. I did so, and he published it in his issue for October, 1913.

In the report on field operations of the U. S. Bureau of Soils for 1911 (published in 1914), Dr. C. F. Marbut, the chief, had a general report on the soils of the Ozark region, covering many counties in southern Missouri. In discussing the agricultural history of the region he noted that originally most of the hilltops were covered with coarse grass, which was frequently burned, but made excellent pasture, which was taken advantage of by the early settlers. But as the number of farmers increased they brought many roads and fields, which served as

barriers to fire, and the grasslands were invaded by scrubby oaks, which reduced the grazing possibilities.

In 1915 the Florida Geological Survey published a report on the natural resources of an area of about one thousand square miles around Ocala, coextensive with four U. S. Geological Survey topographic maps made long before, and a currently prepared soil survey of the "Ocala area" by the U. S. Bureau of Soils. It included Lake Tsala Apopka, previously mentioned. Two representatives of the state Geological Survey had gone around with the soil surveyors and mapped the vegetation at the same time, but had not attempted to fit it exactly to the soil types. And they had done a very good job, considering that they had no training in botany.

I was in Alabama again when most of the abovementioned field work was being done, but when I returned to Florida early in March, 1914, the State Geologist asked me to take the manuscript vegetation map into the field and prepare descriptions of the vegetation to fit it. I did not have to "start from scratch" for I already had field notes on parts of the area covered. But that gave me an opportunity to go into more detail.

I had to follow the map exactly, without changing it, but very few changes would have been called for, unless to make more or fewer divisions in some places. My report was published in 1915. I recognized a dozen types of vegetation, and discussed the supposed frequency of fire in most of them, going into considerable detail in the chapters on scrub and high pine land. One interesting area was a patch of sandy hammock a few miles south of Ocala that owed its protection from fire not to water nearby, but to a more typical hammock that almost surrounded it.

Miss E. F. Andrews (1840-1931), a talented lady interested in botany and various other subjects, author of botanical texts and already in her seventies, made a study while living in Rome, Georgia, of the influence of fire on Longleaf Pine on some mountains near there. She made some experiments which I could not have done because I never stayed in one place long enough. Her findings were published in a leading botanical

magazine, the *Botanical Gazette,* in December, 1917, but were received rather coolly by the fundamentalists.

Not long after that S. W. Greene, who had charge of a grazing experiment station in southwestern Mississippi, independently reached the conclusion that fire in Longleaf Pine forests was good for grazing, instead of the contrary as had commonly been claimed. It had been the almost universal opinion that fire in the pine woods in the spring, although it removed the dead grass and soon made fresh grass available, and was set purposely by many stockmen for that reason, gradually impoverished the soil by destroying nitrogen in the herbage, and thus made future grazing poorer and poorer. One of the charges that used to be made against the South, indirectly at least, was that its people were so ignorant or short sighted that they would weaken the forests and impoverish the soil by burning the woods in spring just to get a little fresh grass for their half-starved cattle. But Mr. Greene came up with a revolutionary idea. Most if not all leguminous plants have a way of taking nitrogen from the air and storing it in tubercles in their roots, so that they do not need to have it in the soil to start with. And most of those in the pine woods have thick roots that are not injured by fire, and they would be crowded out by the grass if they were allowed to pile up dead on top of the ground. The fires presumably return the inorganic material in the herbage, pine straw, etc., quickly to the soil instead of letting it be locked up for several years in the undecayed vegetation.

Then by actual experiment Greene found that cattle gained weight faster in burned than in unburned pine woods, because they had access to more leguminous forage. He gave talks on the subject to conventions of foresters (which I attended) in 1922 and 1923, and wrote about it in newspapers. But some, if not most of the newspaper men, had been so thoroughly "brainwashed" by the foresters that some of them, when they came out to get a "story" about his work, would go back and deliberately misrepresent the facts (as told to me when I visited him in the spring of 1936).

Mr. Greene summed up his findings in an article "The

Forest That Fire Made," in *American Forests* for October, 1931 (unaware that I had discussed the same subject in a limited way in the same magazine—with a different editor and a slight change of name—18 years before). The editor tried to soften the blow to the foresters by leaving out some of the manuscript and by adding comments before and after it, but Mr. Greene got around that partly by adding a privately printed supplementary note, embodying some of the omitted facts, to his reprints.

Also in 1931, Herbert L. Stoddard, Sr. published a bulky volume on the Bobwhite Quail and its habits. Previous to that most people had thought that fire was very detrimental to quail and other birds, by destroying some of their food and shelter and even their nests. But Mr. Stoddard showed that the facts were just the reverse. Fire, by burning off dead grass, such as broom-sedge, favored the growth of leguminous plants, such as Partridge Pea, whose seeds were an important food of the quail.

Not long after that some woman whose name I do not now recall gave a lecture on the general subject of conservation, illustrated by colored slides of birds, flowers, etc., at the University of Alabama. Her arguments were based on emotion rather than logic, and the substance of them was, "Here's a pretty flower, don't burn it," and "Here's a pretty bird, don't destroy its nest." To illustrate the topic of soil conservation she used a picture of the Grand Canyon as a horrible example of erosion, regardless of the fact that it must have started thousands if not millions of years before there were any human beings on earth to start gullies by careless plowing.

Dr. H. H. Chapman of the Yale Forest School began writing about Longleaf Pine and fire about 1932, and noted that he had observed the importance of fire in Louisiana about twenty years before (which must have been about the time I published my observations on the subject in Florida). With that example to stimulate them, several other foresters who may previously have been wary of expressing themselves contributed important papers in the next few years. But there were still a

few reactionaries, or dissenters. (See the chapter on fire in my 1943 report on the forests of Alabama.)

Again going back awhile: when I first went to Alabama, in 1905, it was mainly to study trees, but I gradually got switched off to reporting on forests first, which I did in 1913, as already stated. The idea of a report on trees had not been forgotten, but money for such research seemed to be scarce in Alabama, and I often took a few months or years off to do similar work in Florida, as I have already mentioned. The State Forester of Alabama, who took office in 1924, knew about my work, and wanted to see it completed, and so gave me an opportunity to work out from his office in 1927, which was quite satisfactory, for it gave me an opportunity to reach some parts of the state more easily from Montgomery than I had from Tuscaloosa.

I did much of the writing of a report on Alabama woody plants in his office, and the idea then was to make it a joint publication of his department and the Geological Survey. But the forester, a New Englander, was a fire fundamentalist, like most foresters in those days, and when he discovered that I intended to tell what I took to be the truth about fire (under Longleaf Pine, etc.) he withdrew his support, and I went back to Tuscaloosa to finish it the following year. Meanwhile I spent another winter in Florida.

That same State Forester about that time began publishing a little news bulletin on matters connected with forestry, and the subject of one for June, 1928, was Longleaf Pine. In that he dissented strongly with the idea that fire could be of any use to that species, and one of his arguments was that no fossil grasses are known, and therefore there could have been no grass, and no fire, in pre-historic times, and the pine got along all right without it.

But even if there were no grasses known in the fossil state, grasses growing in dry pine woods, even if never burned off, would have very little chance of being preserved as fossils. And even if the pine forests in ancient times had been completely bare of herbage, the pines would deposit enough pine straw in

a couple of years to make a continuous carpet so that fire, whether set by lightning, spontaneous combustion, or otherwise, could easily run through. But if for some reason fire did not come for several years the pine straw would become so thick that there would be no more germination of pine (which in the Longleaf at least seems to require bare soil), and the pine would gradually die out.

It should be noted here that pines of many kinds, with various lengths of leaves, are widely scattered over the northern hemisphere, and in Mexico, Central America, the West Indies, northern India, and the Philippines, there are species with long leaves that grow in forests, presumably kept so by frequent fires, though my information on them is scanty. We may have to assume that the leaves of the shorter-leaved pines are less oily and decay more rapidly than those of the Longleaf, or else that their seeds are not so dependent on bare soil for germination. Otherwise the short-leaf straw would accumulate sufficiently to be combustible in a few years like the long-leaf straw, and would be ready to burn then, instead of burning only once in the life-time of a tree as seems to be the rule with some of the species having the shortest leaves.

The Western Yellow Pine (*Pinus ponderosa*), which in one form or another grows over as wide an area in the West as the Longleaf does in the Southeast, has fairly long leaves, and grows typically in open forests, which must be burned over fairly often, but I have not been in them enough to make any useful observation on fire there.

In 1948 the present State Forester of Alabama gave a talk to the Alabama Academy of Science on "the Present Condition of Alabama's Forest Resources," illustrated by statistics of various kinds, and going well back into history. He mentioned a few early botanists cited in Mohr's *Plant Life of Alabama* (1901), who wrote little or nothing about trees and nothing about forests, but not my two reports on Alabama forests (1913, revised 1943), though he could not possibly have been unaware of them, as I was in the same office with him in 1927. The reason for his omission was presumably that if his hearers

were informed about my work they might get some ideas about fire that the foresters preferred to keep covered up.

In the summer of 1953, I spent about a week in southern Georgia, traveling with two botanists from the University of Georgia, and trying to re-discover some little-known plants that I had discovered around the turn of the century, and that did not seem to have been collected since. The coastal plain of Georgia is quite diversified in soil, topography and vegetation, but on that hurried trip I could not do much more than make hasty comparisons between the upper and lower halves.

The upper half, on account of its richer soil and drier summers, is now so extensively cultivated that there is not much forest left to burn and so fire is no problem there. The lower half is still mostly pine forest of one kind or another, with the best trees cut out long ago. But the anti-fire propaganda of the foresters has been effective enough to allow the forests to become partly choked up with bushes. There is a partial exception around Thomasville, where some of the winter residents who own large estates there have preserved large areas of Longleaf Pine and accepted Mr. Stoddard's idea that it needs fire for perpetuation. But even there the protected areas are not unbounded, and within them it is hard to get the right fire frequency voluntarily, and it seemed to me that the owners had erred a little on the side of too much protection.

A striking illustration of the effects of fire protection there is afforded *Myrica cerifera* (commonly known as Wax Myrtle, though it is very different from the myrtles of the Old World, and belongs to an entirely different family). It is a small tree or large shrub, which prefers moderately rich and damp soil, with pretty good protection from fire. In 1906 I published a study of the Altamaha Grit region (rolling wiregrass country), an area of about 10,000 square miles midway between the fall line and the coast, and I had only two or three localities in it for *Myrica cerifera.*

At the same time *M. pumila*, differing from *M. cerifera* chiefly in size, being usually about knee-high, was fairly common in flat damp pine woods frequently burned over, but, like

several other shrubs in similar habitats, it was protected from extermination by having a network of underground stems, that would put up new shoots after a fire.

In 1953 I saw *M. cerifera* several times almost every day of the trip, while *M. pumila* was correspondingly scarcer, as if fire protection was gradually turning one species into the other. I have noted what seems to be a similar development in Mississippi between 1913 and 1960; and just in the last few days, in looking through my 1914 Florida notes, I find that I noticed that the two supposed species seemed to be intergrading near Ocala, in a habitat with medium fire frequency.

If time (or space) permitted, much more could be said, about my observations in various other parts of the country, and about how foresters, or some of them, have in recent years been gradually coming around to the idea that forest fires are not an unmitigated evil. Some of them are even cautiously recommending controlled burning in forest management. But they still have the newspaper men pretty well fooled, so that we can read almost any day about so many hundred or thousand acres of forest in some state being "destroyed" by fire; whereas if one should go to the same place a year later he might find that it differed very little from what it was before the fire. Fire lookout towers, even where there is very little forest in sight to be protected, still dot our landscapes, and warnings against fire line our highways.

In Butler County, Alabama, in the upper part of the Longleaf Pine belt, with other useful pines also accessible, within a few miles of a large sawmill that has been operating for many years on a conservative, sustained-yield basis, there is, or was a few years ago, a fire demonstration plot beside a main highway, for all travelers to see. It consists of two adjoining square plots of something like an acre each, with signs announcing that one is burned every year, and the other completely protected from fire. When I last saw them, a few years ago, the contrast was striking enough, but deceptive.

Much would depend on the season of burning, which was not specified (but might vary), but the annually burned

one had plenty of grass and only a few scattered trees, mostly Shortleaf Pine (*Pinus taeda*), as I recall. And those must have been there before the experiment started, for even Longleaf Pine could not perpetuate itself with annual fires. The protected plot was thickly covered with trees of various sizes, mostly pines, but not Longleaf, and not much to interest a lumberman. The proper treatment would have been somewhere between those extremes.

It has been suggested that even if Longleaf Pine can stand fire better than any other tree, if it were given as much protection as possible it might grow faster and larger. But then it would have no chance to germinate, and no protection against such diseases as brown-spot, and the present crop might be the last. By the same logic, "do-gooders" might advocate moving the Eskimos to warmer climates, where they could be more comfortable, and enjoy a "more abundant life." That indeed is a popular philosophy of government today, and the American people are coming to expect to be cushioned against all sorts of inconveniences and discomforts by governmental agencies, and are getting flabby in body and mind, quite unlike their ancestors of a century or so ago.

We might even get to raising Longleaf Pine as a cultivated crop, and plowing the soil every year to make a good seedbed and prevent fires; but such timber, while perhaps suitable enough for pulpwood, or turpentine, would lack the strength of that in natural forests.

There are several reasons for the anti-fire propaganda, some better than others. One is that it is human nature to put expediency before foresight, and favor any policy that promises immediate benefits to some or many people, regardless of ultimate consequences—which may be disastrous. And that is one of the main reasons why the world is in such a mess today. The damage done by fire can be seen immediately, whereas its beneficial effects may be years in materializing. Those who witnessed or heard about the great conflagrations mentioned farther back, or have even had houses or fences destroyed by small forest fires close by, are not easily convinced that fire is any-

thing but an evil. Similarly, most people would kill a snake or a hawk at sight, without stopping to distinguish between useful and harmful species.

Another reason for such propaganda is that if nobody worried about fire any more, many foresters, rangers, etc., who spend much of their time fighting it, might soon be out of jobs. And indeed a certain amount of fire-fighting is justifiable, for in this now thickly settled country, with too many irresponsible citizens, too many fires are set at the wrong times or places, and those cannot be ignored. So we need to keep informed.